

(a) coupling, with a first uni-directional bus in a first predetermined direction, each of the bus elements to a central unit via one of a plurality of first bus inputs;

(b) selecting with arbitration means one of the first bus inputs to the central unit to be an output;

[and]

(c) coupling with a second uni-directional bus in a second predetermined direction said output to each of the bus elements; and

(d) providing for an arbitrated, point-to-point coupling of a particular one of the plurality of bus elements with at least another bus element.

REMARKS

I. GENERAL

Applicants respectfully submit the above amendments and these remarks in response to the Office Action dated December 14, 1992.

In this Amendment, applicants have canceled claim 40 without prejudice and have amended claims 1, 11, 14, 15, 19, 20, 21, 24, 25, 30, and 33 to more particularly point out and distinctly claim the subject matter of the present invention. In response to the Examiner's comments in the Office Action, applicants have made corrections to the Figures 1-4. The corrections which applicants propose are made in red ink on the attached copies of the drawings. With respect to the corrections to the drawings, the corrections to Figure 1 are supported in the specification at page 6, line 25; the corrections to Figure 2 are supported in the specification at page 9, line 8; the corrections to Figure 3 are supported in the specification at page 11, line 10; and the corrections to Figure 4 are supported in the specification at page 13, lines

21-23. Applicants respectfully request that the Examiner approve these drawings, as amended.

Applicants have also amended the specification to correct typographical errors in the text. No new matter was added by these amendments. Hereinafter, applicants will set forth their grounds which plainly demonstrate the application should be allowed and passed to issue.

II. TRAVERSE OF THE § 112 REJECTIONS

Claims 1 through 39 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention. It is respectfully submitted that the above amendments to the claims traverse the Examiner's indefiniteness rejections.

In view of the above amendments to claims 1, 11, 19, 21, 25, 30 and 33, applicants respectfully submit that these claims are definite. Claims 2 through 20, 22 through 29, 31, 32, and 34 through 39 stand rejected as incorporating the deficiencies of the parent claims (1, 21, 30 and 33). In consideration of the foregoing remarks in respect of claims 1, 21, 30 and 33, it is respectfully submitted that the applicants also traverse the Examiner's rejections of these dependent claims for indefiniteness. As such, it is respectfully requested that the Examiner withdraw his rejections of claims 1 through 39 under 35 U.S.C. § 112, second paragraph.

Also, applicants note that the Examiner has rejected claims 20 through 29 under 35 U.S.C. § 112 only. As such, applicants respectfully submit that these claims are now in condition for allowance. Therefore, Applicants respectfully request that these claims be allowed.

III. TRAVERSE OF THE § 103 REJECTIONS

A. General

Claims 1 through 19, 30 through 35, and 37 through 39 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,837,682 to Culler ("the Culler patent") in view of U.S. Patent No. 4,470,114 to Gerhold ("the Gerhold patent"). In light of the Examiner's rejections of these claims over the Culler and Gerhold patents, applicants respectfully submit the following summaries of the cited references and the present invention, as recited in the claims, in order to highlight the deficiencies of those references.

B. The Culler Patent

The Culler patent is directed to a "bus arbitration system for use in a data processing system which operates on clocked cycles for determining priorities in accessing a system memory and one or more local memories associated with processor units." (See Abstract). The Culler patent describes a system for determining whether a conflict exists between multiple requests for access to the various memories in the system (across the system bus and the local buses), and a way to provide for parallel operations in the presence of no conflict to access the same memory. (See column 3, lines 13-26). This system allows for an increase in bandwidth over a system which could only process one memory access at one time.

C. The Gerhold Patent

The Gerhold patent is directed to a processor network employing serial-by-byte information transfers in a time-multiplexed fashion. (See Abstract). In the presence of multiple requests for access to a local bus, the system of the Gerhold patent provides for a round-robin access, one information byte at a time, of the requesting processors to

the local bus, with each clock time. (See column 2, lines 23-37). The system of the Gerhold patent allows for the partitioning of information from a variety of information transfers into bytes, and the time-multiplexing of the information, over the local bus. (See column 3, lines 40-43).

D. The Present Invention

The present invention relates to a high speed bus system which includes a number of processors and a shared memory system. The high speed bus system also includes a control unit which couples the shared memory system and each of the processor units via uni-directional buses. The control unit includes arbitration logic. The control unit providing for arbitrated point-to-point access, for example, of one of the processor units with the shared memory system.

E. Claims 1-19, 30-35, And 37-39 Are Non-obvious

Applicants respectfully submit that the Culler and Gerhold patents, alone or in combination, fail to teach or suggest or render obvious the present invention as manifest in claim 1. In particular, the cited references are devoid of any teaching or suggestion of a control unit which couples to bus elements, such as processors and shared memory, via uni-directional buses further providing for bus arbitration prior to bus access by one bus element. Specifically, the Culler patent, taken either alone or in combination with the Gerhold patent, fails to teach or suggest or render obvious at least the following of claim 1:

"...a central unit having a plurality of bus inputs and an output, with the central unit coupling at least one of the inputs to the output;

"...the central unit adapted to provide for an arbitrated, point-to-point coupling of a particular one of the plurality of bus elements with the at least one other bus element..."

As such, it is respectfully submitted that claim 1 is patentable over the Culler and Gerhold patents, either alone or in combination. In addition, since claims 2-19 depend from and contain all the features of claim 1, applicants respectfully submit that these claims are also patentable over the cited art.

With respect to claim 30, applicants respectfully submit that the Culler and Gerhold patents, alone or in combination, also fail to teach or suggest or render obvious the invention of this claim. In particular, these references fail to teach or suggest or render obvious the arbitration logic and the plurality of uni-directional buses for the same reasons as stated above in respect of claim 1. As such, it is respectfully submitted that claim 30 is patentable over the Culler and Gerhold patents, either alone or in combination. Since claims 31 and 32 depend from and contain all the features of claim 30, applicants respectfully submit that these claims are also patentable over the cited art.

Applicants also respectfully submit that the Culler and Gerhold patents, alone or in combination, fail to teach or suggest or render obvious the method of claim 33. Specifically, the cited references are devoid of any teaching or suggestion of the coupling of a control unit to bus elements, such as processors and shared memory, via uni-directional buses further providing for bus arbitration prior to bus access by one bus element. As such, the Culler patent, taken either alone or in combination with the Gerhold patent, fails to teach or suggest or render obvious the step of at least the following of claim 33:

"....providing for an arbitrated, point-to-point coupling of a particular one of the plurality of bus elements with at least another bus element..."

As such, it is respectfully submitted that claim 33 is patentable over the Culler and Gerhold patents, either alone or in combination. Also, since claims 34-39 depend from and contain all the features of claim 33, applicants respectfully submit that these claims are also patentable over the cited art.

Applicants have traversed the Examiner's bases for rejecting claims 1-19, 30-35, and 37-39 for obviousness and request that this rejection be withdrawn.

IV. CONCLUSION

In view of the foregoing, it is respectfully submitted that each of the pending claims 1-39 is now in condition for allowance and such allowance is respectfully requested.

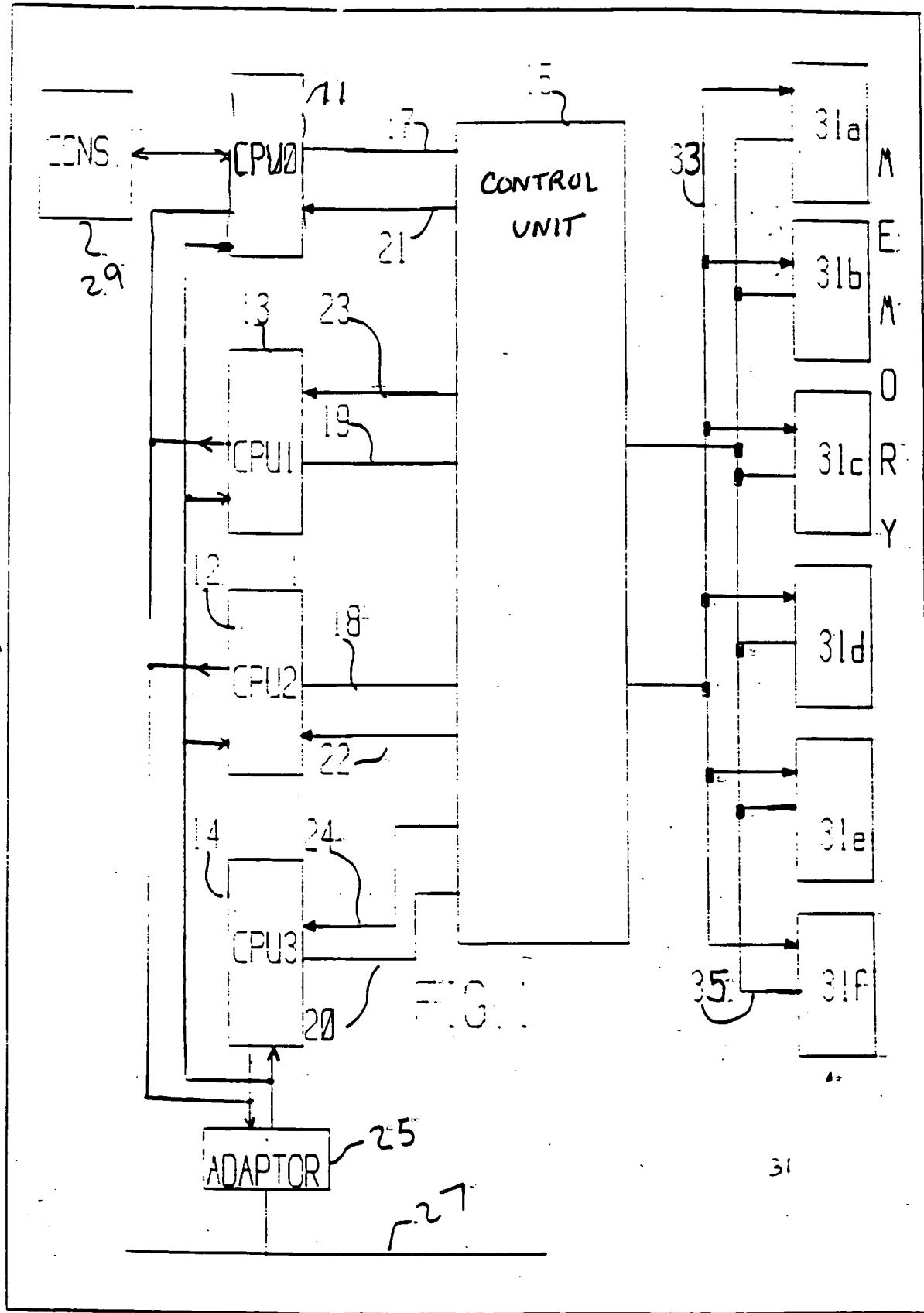
An early and favorable action on the merits is also respectfully requested.

Respectfully submitted,



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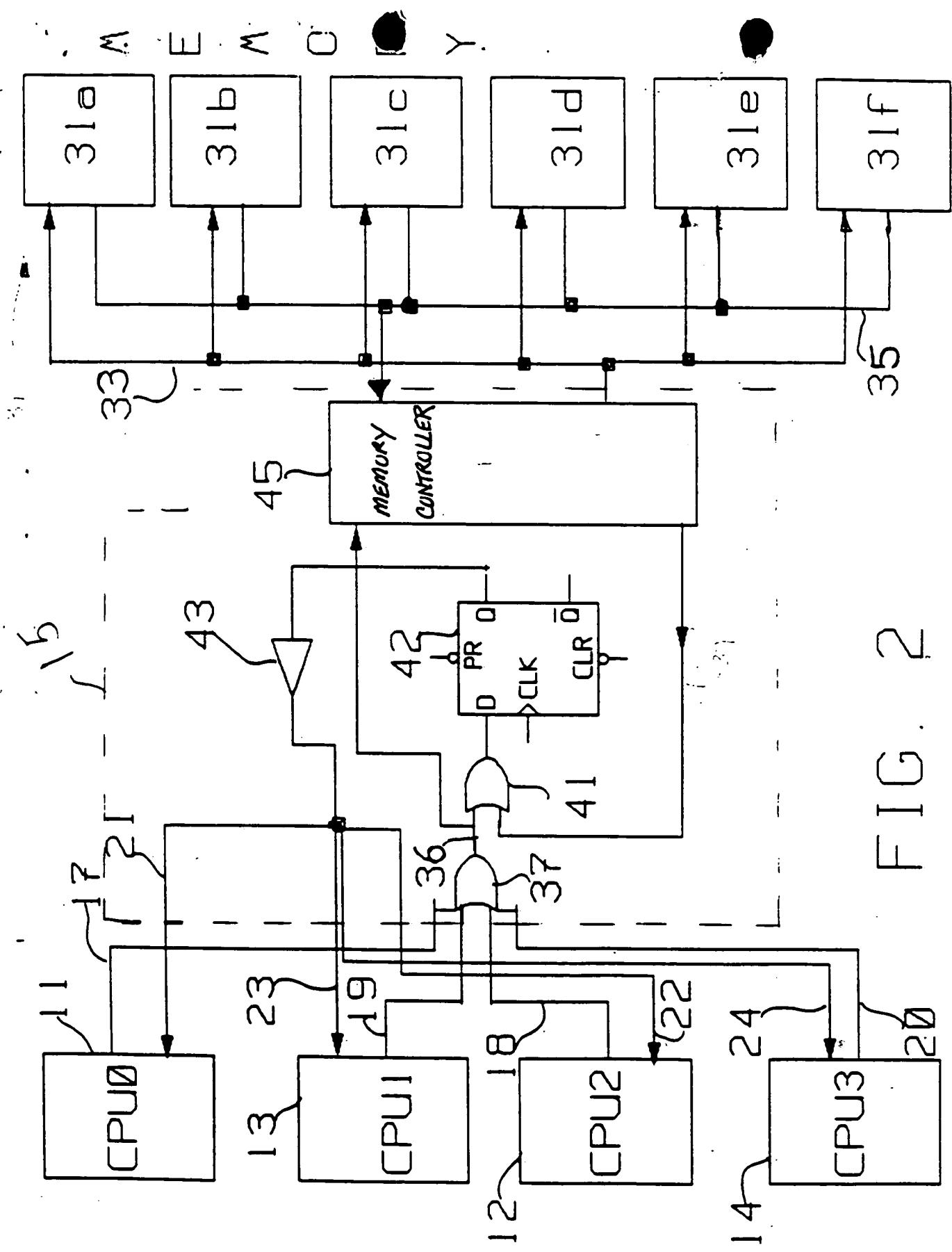


FIG. 2

31 F

31 E

31 D

31 C

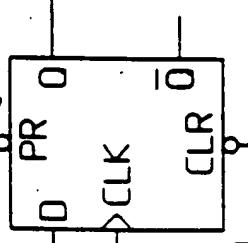
31 B

31 A

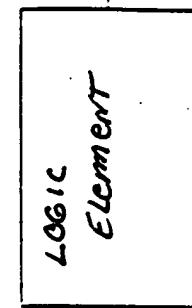
33

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42



4



Logic Element

50 FIG. 3

15

43

17

21

11

CPU0

23

13

CPU1

18

CPU2

24

CPU3

12

14

CPU0

CPU1

CPU2

CPU3

11

23

18

24

15

43

17

21

33

45

31 A

31 B

31 C

31 D

31 E

31 F

31 G

31 H

31 I

31 J

31 K

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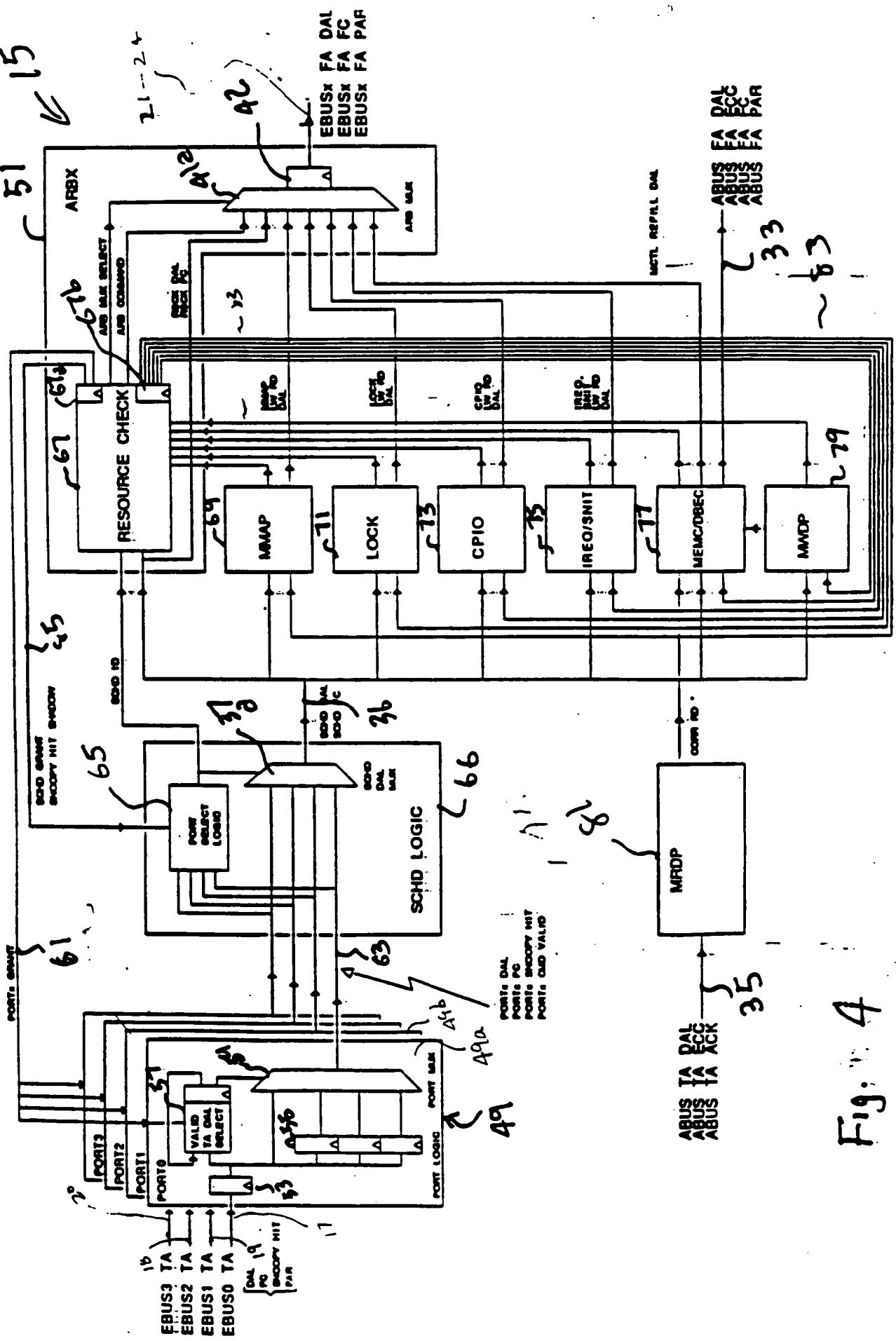


Fig. 4